ON GRASS-TREE GUM.

By J. H. Maiden, F.L.S.

Part I.—Particulars more or less applicable to all the species.

Botanical Origin.

Grass-tree "gum" is the produce of various species of *Xanthorrhœa*. There are twelve species of this genus, which belongs to the Liliaceæ, and several (perhaps all) exude resin from the caudex. A synonym of one or more species is *Acaroides resinifera*, Gray.*

Writers on the subject have usually simply alluded to the resin as that of *Xanthorrhœa*, without denoting the species, and sometimes without giving a description of the resin. Under these circumstances, it is frequently impossible to denote with certainty the species alluded to. Still, of the species obtained from Sydney, it may generally be said that the light (yellow) coloured resin is the product of *X. hastilis*, while the darker (red) one must have been obtained from *X. arborea*.

The plants are always known as "grass-trees," owing to the rush-like or grassy tufts of leaves which adorn the stem. In the very early days they were sometimes called "dwarf palm trees." The term grass-tree "gum" is of course scientifically untenable, as it is insoluble in water; it is soluble in spirit and is a true

* I have been at much pains to endeavour to trace this genus. It has nothing to do with Asa Gray's visit to Australia, as it was in use at least as early as 1795 (see "Bibliography"). It is not to be found in the *Genera Plantarum* of Bentham and Hooker, nor in any of the works of similar scope in the French and German languages to which I have had access. I suppose, therefore, that it never had any claim to the acceptance of botanists, and it might be consigned to oblivion except that it originated the names "acaroid resin" and "gum accroides," which are to be seen English standard works by the score. The former is even used in a work of high importance published in the present year (Morley and Muir's *Watts' Dictionary of Chemistry*). It is apparently a name coined by English druggists to denote a product which came to them without a name, and it has never been used in Australia so far as I can learn.

resin. It is occasionally called "black-boy gum," and in English books now and then "acaroid resin" or "gum accroides." It has also been called "Botany Bay resin."

Collection and Commerce.

"Grass-tree gum" is in small demand, the ordinary retail price being from fourpence to sixpence a pound in Sydney, and the wholesale price of course much less. As usually found in commerce, the resin of *X. hastilis* is in very small pieces (almost powder), or else these small pieces are aggregated, forming a friable mass. In this state it is more or less impure, being mixed with soil and fragments of the bases of the leaves. *X. arborea* resin is usually in larger masses. After a bush-fire (or even the heat of the sun) has passed over grass-trees, the heat causes the resin to run into more or less spherical masses, which are sometimes also darkened, either from destructive distillation, or possibly by admixture with carbon particles. I have some pieces as spherical as if turned in a lathe. These masses can be picked out either from the interior of the charred stump, or from the ground at the place where a grass-tree once grew. Such masses present the resin in a very pure form, but collecting in this way would entail too much labour to be profitable commercially.

Following is a description of the method of obtaining grass-tree "gum."

The articles required are an axe, a flail, a coarse sieve, and a sheet. The stems of the grass-trees are chopped down, broken up into convenient pieces, and allowed to fall into the sheet. A stout stick or flail completes the work of disintegration. The substance is then passed through the sieve, the ligneous portions of the grass-tree for the most part failing to pass through its meshes. A gentle breeze is considered sufficient to winnow what has passed through the sieve, and render it ready for the market. But it often comes to Sydney without having been subjected to any winnowing process.

An interesting (though now somewhat out of date) account of grass-tree "gum," by Mr. P. L. Simmonds, will be found, *Pharm. Journ.* [2], viii., 78. It is, however, to be observed that the collection of the resin now gives employment to very few persons.

Following are some remarks on *Xanthorrhœa* resins by the expert appointed to report on such substances at the Colonial and Indian Exhibition *(Reports,* p. 286). Coming from such a source they carry weight, and are an encouragement to endeavour to properly place grass-tree "gum" on the market. The complaint as to the unequal quality of the commercial article should be taken to heart by those concerned.

"One may regard the resinous element of the *Xanthorrhœa* gums as the constituent more immediately to be utilised industrially, as one would suppose the European markets to be open to receive a very large amount of this material, if sold in such a form that the average consumer could see it readily. The crude gum does not look very attractive to the purchaser in the European market, as it contains a large—and what is worse, a very variable—percentage of matter insoluble in alcohol ; and its purchase would involve an assay of each consignment, together with the attendant inconveniences, and the possibility of misunderstanding. Apart from this, it must be remembered that manufacturers—especially small manufacturers—have a rooted, and not altogether unreasonable, objection to use a variable article, as it disturbs the routine of their operations. All these considerations—to say nothing of the saving of freight—point strongly to the desirability of roughly purifying the resin before sending it to Europe. A sufficient purification is a very simple matter, and could be well carried out on the spot where the material is found, thus saving expense in land as well as ocean transit. It would suffice to soften the crude gum by heat, and to squeeze the softened resin through cloth or through a fine iron wire netting, such as is used for straining gutta-percha. The heat of boiling water is sufficient for the purpose. The separated resin could well be put on the market as an approximately constant article—varying mainly as regards colour—and one which numberless small producers could use in their trades. The water in which the crude gum is boiled dissolves out more or less colouring matter, and also astringent or tanning substances,*

* These products are only present in insignificant quantities, and utterly unworthy of commercial notice.—J. H. M.

and possibly, if the purification were undertaken on a larger scale, these might be turned to account."

Uses.

The aboriginals prepare cakes of it for the purpose of fastening on the heads of spears, &c. But I have no doubt that a good deal of the "black gum" which is frequently referred to in books as being used for that purpose, is the product of a *Myoporum*, probably *M. platycarpum.*

The complete heads of W.A. spears are "stained with the gum of *Xanthorrhœa* to render them smooth and impervious to moisture" (Brough Smyth, i., 336, 340, 341).

Grass-tree "gum" is frequently used instead of shellac, in the manufacture of inferior sealing wax.

It is used by Chinese polishers, and also by some Europeans, as a substitute for shellac in French polishing; but its use for such a purpose is to be deprecated for the following reasons:—Work done with it is more or less sticky at first, though afterwards it frequently becomes so hard and brittle as to peel off like blistered paint. The result, whichever of the two things happens, is that French polish cannot subsequently be used on the article except after stripping. Other objections are that the wood darkens and often shows a play of colours. Also, water leaves white marks if splashed on the grass-tree gum polish; from benzoin or shellac polish it can be wiped off without injury.

Mr. Charles Moore *(Reports, Sydney Int. Exhibition, 1879)*, states that grass-tree gum is "used for coating the bottoms of punts and small boats, and is said to be a good preservative."

It could probably be used in candle-making, for it burns by itself with a bright flame, and mixes with fat in all proportions. It is used in the manufacture of sealing-wax, lacquers, japanners' gold size, &c., and generally as a substitute for shellac. "An excellent spirit varnish" is said to be made from this resin by adding to about one gallon of methylated spirit (cold) about $2\frac{1}{2}$ lbs. of "gum," about $\frac{3}{4}$ lb. of common resin, and $\frac{1}{2}$ lb. of shellac, and then straining through a muslin cloth.

The medicinal properties of grass-tree gum appear to be not well marked. As early as 1795 acaroid resin was said by Kite (see "BIBLIOGRAPHY") "to neither vomit, purge, nor bind the belly, nor to act materially as a diuretic or diaphoretic. Dr. Fish (*Boston Journ.*, x., 94) employed it in the form of tincture with opium in fluxus hepaticus and the colliquative diarrhœa of phthisis, and it has been recommended in chronic catarrhs. A tincture of acaroid resin which has been given in doses of one to two fluid drams, with milk or a mucilaginous liquid, has been recommended to be made of equal weights of the resin and alcohol, and, according to another formula, of 2 ounces of resin to 1 pint of alcohol. If used at all, the latter formula would appear to furnish a preparation of the proper strength." [Prof. H. C. Maisch (see "BIBLIOGRAPHY")]. The subject of medicinal qualities is further dealt with under *X. hastilis*, p. 434.

The *Xanthorrhœa* resins have been repeatedly suggested as possessing some value in perfumery, but they are inferior for this purpose to benzoin, storax, and the balsams of peru and tolu. Some of them which contain benzoic acid are aromatic when burnt, and owe their pleasant odour wholly or in part to that substance. Abundance of picric acid, a very powerful yellow dye, can be obtained from grass-tree "gum." But this substance can be so cheaply made from coal-tar, that grass-tree gum is not now thought of for that purpose. The result is that many storekeepers in the colonies, who eagerly bought up grass-tree "gum" as a speculation, with the view of exporting it to England, have for years past had stocks on hand, and quantities now sold have frequently been gathered say fifteen or twenty years.

PART II.—*XANTHORRHŒA HASTILIS* (THE SPECIES USUALLY ALLUDED TO BY WRITERS AS GRASS-TREE "GUM").

XANTHORRHŒA HASTILIS, R.Br., B.Fl., vii., 115.

Found in New South Wales and Queensland.

This remarkable plant, and its exudation of resin, attracted the very early attention of the first colonists. Probably their attention would have been invited to it in the first instance by the blacks,

who still use it as a cement, as has already been mentioned. For the earliest actual allusions to the resin of *X. hastilis*, I am indebted to Barton's "History of New South Wales," pages 280 and 504.

On the 15th of May, 1788, Governor Phillip alludes to "the yellow gum which is found on the dwarf palm tree."

On the 18th of November of the same year "an officer of Marines" speaks of "some of which have been used medicinally with success by the surgeon, Mr. Considen, particularly the yellow gum, a substitute for balsam of tolu." The statement is hard to comprehend, as grass-tree "gum" is as unlike balsam of tolu as it can possibly be, nor has its use in medicine been continued.

Both Surgeon-General White and Governor Phillip notice it in the books they wrote on the Colony. Following are their statements :—

"*The Yellow Resin Tree.*

"But the most valuable produce of this plant seems to be its resin, the properties of which vie with those of the most fragrant balsams. The resin exudes spontaneously from the trunk; the more readily if incisions are made in its bark.* It is of a yellow colour; fluid at first, but being inspissated in the sun, it acquires a solid form. Burnt on hot coals it emits a smell very much resembling that of a mixture of balsam of tolu and benzoin, somewhat approaching to storax. It is perfectly soluble in spirit of wine, but not in water, nor even in essential oil of turpentine, unless it be digested in a strong heat. The varnish which it makes with ether is very weak, and of little use. With respect to its medicinal qualities, Mr. White has found it in many cases a good pectoral medicine, and very balsamic." (Dr. James Smith, in "Journal of a Voyage to New South Wales," by John White, Esq., Surgeon-General to the Settlement, 1790, p. 235. No figure of this plant is given, but some old basal leaves are figured.)

In "The Voyage of Governor Phillip to Botany Bay," 1790, a crude figure of this *Xanthorrhœa* is given, and (p. 51), concerning the resin, it says . . . "in appearance it strongly resembles

*I have never heard of a *Xanthorrhœa* being subjected to this treatment. It has no bark, but shows scars of leaves like a tree-fern.

gamboge, but has not the property of staining. . . . The resin is generally dug up out of the soil, under the tree, not collected from it, and may perhaps be that which Tasman calls 'gum-lac of the ground.'"

Its ordinary appearance in the bush is of a dirty crimson colour. It readily fractures, and it is then seen that this colour is only superficial, and that the resin is yellow or orange-coloured, strikingly-like (in appearance) gamboge, and sometimes like the artificial Burgundy pitch of the shops.

It is well known for the pleasant perfume it exhales when exposed to sufficient heat to volatilize it without decomposing it completely. In Curtis' *Bot. Mag.*, 79, 4722, it is alluded to as "spear yellow gum," and the statement is made that it is "now used, we are told, as incense in the Roman Catholic churches of the Colony."

In Wagner's *Chemical Technology* (Crookes), p. 484, the statement is made that "New Zealand resin, the produce of *Xanthorrhœa hastilis*,* is now frequently used instead of shellac." No species of *Xanthorrhœa* extends to New Zealand.

The following are a few experimental notes on this interesting resin.

A sample collected by the author near Sydney represents the resin in a very pure form, as no pains have been spared to pick out lumps free as possible from adventitious matter. It possesses a sweet odour† similar to that of benzoin, which is much increased on powdering the substance. It fractures readily with a shining fracture, and is reducible with the greatest facility to an impalpable powder. No substance bears a greater resemblance to it than powdered gamboge, although that pigment is perhaps a shade darker. Exposure to the light causes the resin to change its colour to Indian red, which is the external colour of masses of pure resin. This colour is only superficial. It does not soften in

* Perhaps kauri resin *(Dammara australis)* is, however, meant.

† "When fresh it has an odour analogous to that of poplar buds, but much more agreeable (Guibourt), while Maisch likens the smell to benzoin mixed with a little storax. By age the odour becomes weaker, and gradually disappears, but it is always developed by powdering or by fusion."

the mouth, but crunches readily, tinging the saliva yellow, and tasting of benzoic acid to a far greater extent than *X. arborea.*

In boiling water the resin melts, the water becoming slightly turbid and of a lightish yellow colour.

Petroleum spirit extracts 1 per cent. of a fragrant body, but apparently containing no benzoic acid.

Alcohol digested on the residue dissolves 94·6 per cent., forming a beautiful yellow liquid. As evaporation proceeds, benzoic acid in beautiful feathery crystals separates out, and the resin collects at the bottom of the vessel, the whole smelling strongly of benzoic acid. This resin melts at 97·7° C. Beyond applying the usual tests for that substance,* nothing further was done in regard to it, for lack of time.

The accidental impurity was 5·3 per cent. (vegetable débris and sand).

A second sample purchased in Sydney is in small pieces admixed with a little ligneous matter. The description already given of this resin will apply here, except that it has a lower melting point, the heat of a Sydney summer fusing it and causing it to run together in the bottles. It is very strongly and deliciously aromatic. Petroleum spirit extracts 2 per cent. of a pale-coloured sticky substance, which is probably a mixture of essential oil and resin.

A third sample from Shoalhaven, N.S.W., collected 14th August, 1886, was then examined.

Petroleum spirit dissolves out 2 per cent. The general effect of cold alcohol and subsequent slow evaporation is the same in this sample as in that already described. The alcohol dissolves out 91·7 per cent. of resin and benzoic acid combined.

The residue (accidental impurity) amounts to 8·1 per cent.

* Stenhouse obtained a quantity of cinnamic acid, in far greater abundance than the benzoic acid, from a sample of *X. hastilis* resin examined by him. But, although I carefully examined the groups of crystals obtained, with regard to physical appearance, and also mixed both them and samples of the original resin with binoxide of manganese and sulphuric acid, I failed to obtain indications of cinnamic acid. I hope some time, however, to give the resin a more thorough examination.

This interesting resin has formed the subject of chemical researches for nearly one hundred years. Following are abstracts from some of them,—none of them recent. A modern research is a desideratum.

"Of a darker reddish-yellow than gamboge, frequently covered with a greenish-grey crust. Brittle, of shining fracture, triturable to a greenish-yellow powder. Does not stick to the teeth. Tastes sour and aromatic, and has an agreeable balsamic odour. Contains a very small quantity of an agreeably-smelling volatile oil; a resin soluble in alcohol and ether, and also in alkalis and baryta- and lime-water; a little benzoic acid and bassorin (Laugier, *Ann. Chim.*, 76, 265). Its solution in ether or alcohol leaves on evaporation a dark resin, containing, at 120°, 66·98 p.c. C, 5·73 H, 27·29 O, corresponding to the formula $C_{40}\,H_{20}\,O_{12}$ and almost entirely precipitable from its alcoholic solution by water, even in the presence of a large quantity of ammonia." (Johnston, *Phil. Trans.* 1839, 292.)

"The resin gives up to boiling water benzoic acid and gum. It dissolves in oil of vitriol, forming a pale brown solution, which is precipitated of a violet-red by water. It colours acetic acid yellow, without dissolving in it to any great extent and dissolves easily in alcohol, ether, some volatile oils, and partially in fatty oils, forming in all cases fine yellow solutions" (Widmann; Lichtenstein) [Gmelin's *Handbook*, xvii., 386-7].

"Colour deep yellow, with a slightly reddish shade, considerably resembling gamboge, but darker and less pleasing. The colour of its powder is greenish-yellow. When gently heated it melts, and when strongly heated it burns with a strong smoky flame, and emits a fragrant odour resembling balsam of tolu. The resin contains a trace of an essential oil, to which much of its agreeable smell is owing. This oil passes into the receiver when the resin is distilled with a mixture of carbonate of soda and water, but its quantity is so small that I was unable to examine it more closely. The resin is insoluble in water, but dissolves readily both in alcohol and in ether, especially in the former. Its solution in

alcohol has a brownish-yellow colour; the addition of water precipitates it as a dark yellow mass, but it does not crystallize out of its alcoholic solution when left to spontaneous evaporation, but remains as a varnish. When digested with strong alkaline lyes, it readily dissolves and forms a brownish-red solution; and when the alkali is neutralized with muriatic acid, the resin is precipitated considerably altered as a dark brownish brittle mass.

"On concentrating the solution out of which the resin has been precipitated, and allowing it to cool, a quantity of impure reddish crystals resembling benzoic acid are gradually deposited. It requires repeated and long-continued digestions with the strongest alkaline lyes to remove the whole of this crystalline acid from the resin, which retains it with very great tenacity. The quantity of the acid is by no means great. It is not easily purified, as its crystals are apt to retain a trace of a reddish colouring matter, from which it is very difficult to free them. The easiest way of getting rid of it is by dissolving the impure crystals in a small quantity of alcohol and then adding water; the greater portion of the colouring matter is retained in solution, while the crystals are precipitated tolerably white. When purified by repeated crystallizations, they become quite colourless. In appearance, taste, and smell, they closely resemble benzoic acid.

"The quantity of carbazotic (picric) acid which Botany Bay resin yields when treated with nitric acid is so great, and it is so easily purified, that this resin seems likely to prove the best source* of that substance. When the resin is subjected to destructive distillation in an iron or copper retort, it yields a very large quantity of a heavy acid oil mixed with a very small quantity of a neutral oil, which is lighter than water. If, however, the resin has been previously digested with alkaline lyes, so as to remove all the cinnamic and benzoic acids it contains, the heavy oil is obtained as before, but none of the light essential oil. The acid oil is readily soluble in soda and potash lyes; in its smell and properties it resembles creosote; when it is digested with nitric

* Superseded by coal-tar now, of course.

acid, it is wholly converted into carbazotic acid, and when a slip of fir-wood is dipped in it, and then moistened with either muriatic or nitric acid, the deep blue colour passing quickly into brown, so characteristic of hydrate of phenyle, is immediately produced, with which substance the oil appears completely identical. The light oil above mentioned, the quantity of which is extremely small, is separated from the hydrate of phenyle by saturating it with an alkali and distilling the mixture in a glass retort with a gentle heat. In smell and properties it resembles benzine, and is most probably a mixture of benzine and cinnamene; unfortunately the quantity obtained was so small, that I was unable to subject it to more particular examination." (Stenhouse, *Phil. Mag.*, June, 1846.)

In *Journ. Soc. Chem. Ind.*, iv., 97, will be found a series of constants, by Mills and Muter, of bromine absorptions, for eight samples of *Xanthorrhœa* resin, comprising *X. hastilis*, *X. Preissii*, and possibly others.

Part III.—Other species of *Xanthorrhœa*.

Xanthorrhœa arborea, R.Br., B.Fl., vii., 115.

Found in New South Wales and Queensland. Monga, near Braidwood, N.S.W., 4th and 5th October, 1886.

This sample is in large concentric masses, consisting of the remains of leaves *(in situ)* cemented together with the resin, the resin usually being so abundantly in excess that large pieces of the pure substance are readily obtainable. The inner portion of these masses is a true mould of the caudex. Where the resin weathers it is seen to be of a liver-colour, but it readily fractures (in a very similar manner to gamboge), and shows a very bright fracture. The colour is pleasing, and I can only describe it as of a rich purplish-brown inclining to crimson. It is readily reducible to a fairly fine powder, which is of a dull burnt sienna-brown, admixed with a few dark particles. The powder possesses a faint aromatic odour, from which the lump appears quite free. It tastes slightly of benzoic acid.

It softens in boiling water, but does not appear to dissolve to any extent. It almost entirely dissolves in rectified spirit, forming a rich port wine-coloured liquid.

Petroleum spirit digested on the resin extracts ·3 per cent of a yellowish resin destitute of odour. If the residue be digested in alcohol, 94·2 per cent. is dissolved out. This consists almost entirely of a deep orange-brown resin. As evaporation proceeds, a few minute needles of benzoic acid are observed to crystallize out, while the concentrated alcoholic liquid smells slightly of the same substance. But in no instance was the benzoic acid in anything like the comparative abundance in which it was obtained in the case of *X. hastilis*. Therefore, when only these two resins are in question, they may readily be distinguished (1) by their colour, (2) by the difference in quantity of benzoic acid.

The accidental impurity amounted to 5·5 per cent.

Neither of this nor of any other *Xanthorrhœa* resins did time permit me to make a qualitative examination of the resin; nor were the products of distillation inquired into.

Sample from Oatley's Grant, George's River, near Sydney.

Petroleum spirit extracts ·3 per cent.

The effect of alcohol is the same as on the preceding sample. It extracted 89·8 per cent. The residue (9·9 per cent.) consisted of débris from the bases of the leaves, and no trace of free carbon could be detected by means of a lens. This observation is interesting in view of the statement I have made above (p. 430) to the effect that the darkening of *Xanthorrhœa* resin may be due to the presence of carbon after bush-fires. This particular sample was gathered by me from the midst of a freshly-extinguished bush-fire, where everything was black and charred, and the resin, dug up almost from the surface of the ground, was black likewise. The resin is a little darker in tint than the other samples of *X. arborea*, both before and after treatment with alcohol, an effect which seems simply due to the heat alone, without admixture of carbon. Numerous other samples will require to be collected and examined before this point is settled.

Three different *Xanthorrhœa* resins were found by Hirschsohn to be incompletely soluble in chloroform and ether, but to dissolve completely in alcohol, the solution acquiring a brown-black colour with ferric chloride. "The solution of the acaroid resin is yellow,* and yields with lead acetate a precipitate, while the solutions of the other two resins are red, that of *X. quadrangulare* being not disturbed by acetate of lead, while that of *X. arborea* produces with the same reagent a turbidity; the chloroformic solution of the latter is yellow; that of the former colourless."

The specimen labelled *X. arborea* at page 148, Cat. Museum Pharm. Soc. (London), is *X. hastilis*, from the description of the resin given.

XANTHORRHŒA AUSTRALIS, R.Br., B.Fl., vii., 116.

Found in Tasmania and Victoria.

The shapes which the resins of the various species of *Xanthorrhœa* assume are quite accidental. Some of these forms are described under various species, and refer to specimens which have actually been examined. The resin of this species "is found in masses of irregular globular shape, within the body of the tree, and exuding in large tears and drops near its roots. It is a dark red friable substance, the purer homogeneous specimens exhibiting a most brilliant ruby colour when crushed into fragments; it fuses readily with the same deep colour, and exhales the characteristic odour of gum benzoin and dragon's blood under such circumstances. In many respects it resembles the last-named substance, but its solutions are less intensely red, inclining to yellow, while as a varnish it has much more body and gloss. It is very soluble in alcohol, and in the essential oils from the *Eucalypti*, that from the Dandenong Peppermint *(E. amygdalina)* proving an exception. Ether takes up a portion only, leaving behind a resinous substance coloured more intensely red than that which it dissolves; turpentine exercises no solvent action upon it, and the drying oils but very little" *(Report on Indigenous Vegetable Substances, Victorian Exhibition, 1861).*

* *X. hastilis* is evidently meant here.

Xanthorrhœa Preissii, Endl., B.Fl.,vii., 117.

"Boro Blackboy."

Syn. *X. Drummondi*, Harv.

Found in Western Australia.

This grows from 20-30 feet high, and is said to produce more resin than any other Western species. From its tenacity, it is used by the natives in making their hatchets, hammers, &c., and in fixing the glass to their spears. They also are said to make from it a bright yellow paint, with which they smear their bodies.

This species is referred to in the following :—

"In 1854, Captain Wray, R.E., submitted a Report to the authorities of Western Australia on the manufacture of illuminating gas from grass-trees, at one-third the expense of lighting with oil and candles. The method of obtaining the material was as follows:—In the first instance, the leaves and resin were separated from the core by breaking up the plant with an axe, and sifting the resin from the leaves; but it was found by experience that as much gas was obtained from an equal weight of the leaves and resin together as from the resin alone. The quantity of resin obtained from an average "grass-tree" was about 45 lbs. weight. This was collected easily at the rate of 5 lbs. per hour by a person with an axe and sieve. The quantity of pure gas obtained was at least 4 cubic feet to the pound of resin and leaves; but much more might be obtained by a more complete apparatus. A cart-load of the plants, eight in number, weighed 1048 lbs. When the core was removed, the leaves and resin weighed 628 lbs. The core is very good fuel when mixed with other wood. The specific gravity of the gas is ·888. The products of the distillation are gas, tar, and coke. The tar obtained was about one quart for every ten pounds, and this, when redistilled, gave 8 per cent. of naphtha, and 20 per cent. of a sweet, spirituous, non-inflammable liquor. The coke remaining was about one-quarter the original weight, and with other fuel burns well. The coke of the leaf has a bright, shining appearance,

and when ground with oil is a very good substitute for lamp-black in paint. The gas has a smell somewhat similar to coal-gas, not nearly so offensive, but sufficiently strong to make any escape immediately perceptible. Its illuminating power appears to be very superior to coal-gas, and its light very white" (Quoted by Mr. P. L. Simmonds in *Journ. Soc. Arts*).

XANTHORRHŒA TATEANA, F.v.M., in Muell. Cens. Supp. 1, for 1885.

Kangaroo Island, South Australia.

Three years ago I received from Mr. J. E. Brown, the Conservator of Forests of South Australia (now Director-General of Forests of this Colony), the handsome resin of this new species. It is obtainable in large pieces free from woody matter. It is more or less vesicular. It breaks up and powders with the utmost facility. The fresh fracture is very bright, and of a rich pure ruby colour; the powder is dead, and of the colour of excellent chrome-orange. The colour of the lumps, originally of a ruby colour, becomes dulled by the friction of the masses against each other, and so becomes from liver-colour to chrome-orange.

Neither in lump nor in powder has the resin any odour at ordinary temperatures.

The finely-powdered substance gives up a little colour (yellow) to cold water, when digested in it. The colour appears to be most marked in this species, although in other *Xanthorrhœa* resins there is a trace of colour. When the water is heated, the resin melts and becomes of a blood-red colour, the liquid becoming turbid at the same time.

Petroleum spirit extracts ·1 per cent. of resin, which appears to be without colour, and is without odour. Rectified spirit dissolves the whole of the remainder (there is but a trace of impurity), forming a beautiful ruby-coloured liquid. Benzoic acid crystallizes out from the resin, and appears to be intermediate in quality between that yielded by *X. arborea* and *X. hastilis*, under similar circumstances.

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XANTHORRHŒA SPP.

1. "On bromine absorptions." Mills and Muter. *Journ. Soc. Chem. Ind.* iv. 96. Resins of various species of *Xanthorrhœa* are experimented upon amongst others.
2. "Notes on the *Xanthorrhœa* resins." J. M. Maisch. *Amer. Journ. Pharm.* May, 1881. *Journ. Pharm.* [3] xi. 1005.
3. "Acaroid resin." *Watts' Dict.* vi. 2.
4. "Paraoxybenzoic acid." *Watts' Dict.* vi. 898.
5. "Grass-tree gum." Simmonds. *Pharm. Journ.* [2] viii. 78.